

LUPIN MINES INCORPORATED

November 29, 2017

Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0A 1J0

Attention: Karen Kharatyan, A/Manager of Licensing

Dear Mr. Kharatyan:

Re: 2AM-LUP1520 – Lupin Mine Project – Lupin Mines Incorporated (LMI) - Response to comments received on Interim Closure and Reclamation Plan and Reclamation Security Cost Estimate

Please accept this letter and enclosures as Lupin Mines Incorporated (LMI) response to the submissions filed by Indigenous and Northern Affairs Canada (INAC) and Environment and Climate Change Canada (ECCC) regarding LMI's Interim Closure and Reclamation Plan (ICRP) (October 2017) and Lupin Mine Reclamation Security Cost Estimate (October 2017). LMI notes it did not receive any comments on the Phase I/II Environmental Site Assessment (ESA) update.

Response to INAC Submission:

INAC Comment #1:

INAC has reviewed the documentation to the extent possible under the timelines provided. INAC supports the efforts outlined in the submission by Lupin Mines Incorporated (LMI) and encourages further efforts to reduce the environmental liability at the Lupin Mine Site.

LMI Response INAC #1:

LMI appreciates that INAC supports our efforts and we look forward to continue working closely to complete our reclamation/closure activities planned for the Lupin Mine site to reduce most if not all of the environmental liabilities. LMI advised INAC in June 2017 that we would be requesting a reduction in security based on the new security cost estimate required under the water licence 2AM-LUP1520 and that it would propose reductions

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Toronto, ON, M5C 1P1, Canada
Tel: 778-386-7340

that would give credit for all progressive reclamation work completed at the Lupin site during the 2016 and 2017 seasons. Consistent with INAC's encouragement to reduce liability the cost estimate submitted on October 18, 2017, LMI proposes a reduction in reclamation bonding of \$13.6M.

Per section 10 of the *Nunavut Waters Regulations*, it is the NWB's role to set the quantum of security required under a water licence:

- *(1) For the purposes of subsection 76(1) of the Act, the Board may fix the amount of security required to be furnished by an applicant for a licence, a licensee or a prospective assignee in an amount not exceeding the aggregate of*
 - (a) the costs of the abandonment of the undertaking;*
 - (b) the costs of the restoration of the site of the undertaking;*
 - (c) the costs of any ongoing measures that may remain to be taken after the abandonment of the undertaking; and*
 - (d) the compensation that a person, including the designated Inuit organization, who is adversely affected by the use of waters or deposit of waste may be entitled to under section 13 of the Act.*
- *(2) In fixing an amount of security, the Board may have regard to*
 - (a) the ability of the applicant, licensee or prospective assignee to pay the costs referred to in subsection (1); or*
 - (b) the past performance by the applicant, licensee or prospective assignee in respect of any other licence.*

LMI's understanding of the NWB process relating to our application is summarized as follows:

- LMI submitted reassessment as required under Part C, Item 4 of current water licence (October 2017)
- Parties provided feedback on ICRP and revised cost estimate (November 2017)
- LMI confirm proposed reduction in liability following comments from all parties (As per this letter of Nov. 29. 2017)
- Nunavut Water Board (NWB or Board) Decision on amendment to security provisions based on reassessment/reduction to security.
- Board Decision on amendment to security referred to the Minister.

Provided the licence is amended to reduce the security required under the Licence, following issuance of the amendment LMI would be promptly refunded the overbonded security amounts.

As it currently stands, the project is overbonded. Once the overbonding amount is refunded, LMI plans to reinvest the refund of security to implement reclamation activities as per the final closure plan.

INAC Comment #2:

INAC would like the opportunity to validate the information provided by LMI through a site inspection before offering more specific comments to the Nunavut Water Board for consideration of the security to be held under the Water License. It is INAC's belief that the earliest an on-site validation exercise could be conducted and inform our comments related to security would be post-freshet 2018. Ideally, INAC and LMI could perform a joint site inspection and prepare estimates based on the same year's on-the-ground assessment of the site. This would limit differences amongst parties understanding of the site.

LMI Response INAC #2:

LMI would highlight that the Mine Site Reclamation Policy for Nunavut (INAC) states, "Mine operators should be credited for approved progressive reclamation and the value of financial security required should be **adjusted in a timely fashion**". INAC has stated that they would like to conduct an additional site inspection before offering more specific comments to the Nunavut Water Board for consideration of the security to be held under the Water License. LMI notes that site inspections were carried out by INAC in 2015, 2016, and 2017 and respectfully disagrees with any further delays in the process. It is not necessary to carry out an additional 2017 site inspection in order for INAC to make substantive comments on LMI's request for reduction in reclamation security.

The renewed water licence 2AM-LUP1520 issued August 19, 2015, Part C, Item 4 required LMI to reassess and update the reclamation security for Board review on or before September 30, 2017. In August 2015, INAC and their consultant from ARCADIS completed a site visit to verify site conditions which supported the 2016 Amendment Process initiated by INAC.

Further, a second site visit was undertaken in October 2016 to verify site conditions, attended by:

- LMI (Karyn Lewis and Patrick Downey),
- INAC (Ian Parsons),
- ARCADIS (on behalf of INAC – Charles Gravelle),
- NWB staff (Dave Hohnstein),
- Knight Piesold (on behalf of the NWB).

Site conditions have continued to improve since 2015 and 2016 site visit. The work program planned by LMI over the next two years to reclaim the site will eliminate most, if not all, environmental liability.

As of 2017, LMI senior representatives has held various meetings¹ with INAC regarding the reassessment and update in reclamation security to support a reduction in security, ideas for future reduction in security, as well as providing updates and timelines² on site closure plans for the next two years where it was discussed that we would be submitting for a reduction in Q4 2017. LMI has advised the NWB and the KIA in separate meetings of the same.

INAC advised the LMI management during a meeting on July 24, 2017 that they would be requesting an inspection of the site to validate site conditions for the security reduction being submitted in September 2017. In August 4, 2017³, LMI provided an update to INAC and the NWB on the status of security and work plans for the site. Information obtained during the 2017 field season could be used to validate site conditions. The INAC Inspector, Eva Paul, carried out inspections under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act (NWNSRTA)* and *Territorial Lands Act* at the Lupin Mine twice during the 2017 season (July and August). The Inspector filed her inspection reports as per the NWNSRTA with the NWB and there were no major concerns with the current site conditions.

LMI strongly believes that INAC were given ample notice and access to validate site conditions during the 2017 season, noting the Lupin Mine site was open until October 20, 2017.

LMI would note the INAC Mine Site Reclamation Policy for Nunavut does not identify the need for site validation inspections to occur for the application and consideration of security reductions associated with progressive reclamation. LMI respectfully disagrees with any further delays in the process.

¹ Teleconferences (July 6 and November 21, 2017), in person meetings in Ottawa (June 12 and July 24, 2017) and in Iqaluit (September 5-6, 2017), and written correspondence (August 4, 2017)

² Refer to Attachment A

³ Posted to the NWB Public Registry at: [http://www.nwb-oen.ca/public/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-LUP1520%20LMI/3%20TECH/2%20SECURITY%20\(C\)/170804%20AM-LUP1520%20Letter%20to%20INAC-ILAE.pdf](http://www.nwb-oen.ca/public/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-LUP1520%20LMI/3%20TECH/2%20SECURITY%20(C)/170804%20AM-LUP1520%20Letter%20to%20INAC-ILAE.pdf)

INAC Comment #3:

INAC would like to request additional information be provided to assist in our review. INAC would like to know if the updated security estimate is based on:

- 1) Knight Peisold security estimate of \$34.65 Million, or
- 2) LMI's original security estimate of \$24.1 Million, or
- 3) Other source(s).

LMI Response INAC #3:

LMI's security cost estimate is a new security cost estimate prepared by an independent third party Golder Associates. The security cost estimate is based on detailed engineering reports, extensive site knowledge and the input of experts, the work of industry contractors with experience in the North and the Lupin mine in particular, as well as Golder's professional opinions. The rates used in Golder's estimate are based on current site specific conditions, INAC recognized methodology, RECLAIM rates as per the INAC Mine Site reclamation Policy where appropriate and actual costs where applicable to the Lupin Mine Site, i.e. tailings cover, as this work is ongoing and rates are known.

In addition, LMI acknowledges the coordination needed in assessment of financial security obligation. LMI is providing a Q4-2017 Progress Report which outlines the current status of 2016-2017 progressive works and 2017-2018 work plan as well clarification of several key issues raised during the during the 2016 amendment process that may warrant further Board consideration at this time. Refer to Attachment B – Q4 2017 Progress Report.

Response to ECCC Submission:**ECCC Comment #1:**

ECCC recommends that the Proponent provide water quality monitoring details including discharge quality objectives in the ICRP.

LMI Response ECCC #1:

LMI agrees with this recommendation and in the next ICRP will include details on the water quality monitoring program and objectives for discharge to the environment.

ECCC Comment #2:

ECCC recommends that the ICRP be updated to include a description of cover performance monitoring and relevant water quality monitoring, including but not limited to seepage and groundwater.

LMI Response ECCC #2:

LMI agrees with this recommendation and the next ICRP will include descriptions of cover performance and water quality monitoring.

ECCC Comment #3:

ECCC recommends that the performance of the water-saturated esker material cover in the Tailings Containment Area (TCA) be monitored over time to confirm the predicted effectiveness of this closure approach.

LMI Response ECCC #3:

LMI agrees with this recommendation and the next ICRP will include a description of TCA cover performance monitoring.

ECCC Comment #4:

ECCC recommends that buried waste that contains residue from burning be covered to a depth that isolates it below the active layer.

LMI Response ECCC #4:

The burned material (ashes) in the landfill will be covered with 2 m of ash free non-hazardous waste material and finally capped with 1 m of inert esker material. The waste rock cover already placed over the closed areas of the landfill will also be capped with 1 m of inert esker material as some of the waste rock material could be potentially acid generating (PAG). If ashes from burned material are encountered elsewhere on the site, the ashes will be transported and disposed of at the landfill and covered as described. The landfill management plan will be updated to address the closure cover details in the final version of the closure plan.

ECCC Comment #5:

ECCC recommends that the ICRP be updated to include a description of treated-soil sampling and testing procedures and soil re-use criteria. Alternate management/ disposal method(s) should be identified, in the event that treated soil does not meet re-use standards.

LMI Response ECCC #5:

LMI agrees with this recommendation and the next ICRP will include a description of treated-soil sampling and testing procedures, soil re-use criteria, and alternate management/disposal options.

ECCC Comment #6:

ECCC recommends remediating hydrocarbon contaminated esker sands. If landfarming does not successfully remediate hydrocarbon-contaminated esker sands to meet re-use criteria, burial on site (with sufficient encapsulation) could be considered as a contingency option.

LMI Response ECCC #6:

LMI agrees with this recommendation and the next ICRP will include a description of alternate management/disposal options for hydrocarbon contaminated esker sands.

ECCC Comment #7:

ECCC supports the development of appropriate and protective site-specific soil quality remediation objectives for metals and petroleum hydrocarbons.

LMI Response ECCC #7:

LMI agrees with this recommendation and will develop site-specific soil quality remediation objectives for metals and petroleum hydrocarbons.

ECCC Comment #8:

ECCC recommends that the ICRP be updated to discuss the spill of oil-contaminated water from the TCAs in July 2012. The extent of the spill, remediation measures (completed and planned), sampling results, and the current condition and extent of the affected area should be discussed.

LMI Response ECCC #8:

Subsequent to the submittal of the IARP and the updated Phase I/II ESA, additional information regarding this spill was made available. Historical records indicate that this spill did not occur within the TCA area, but rather occurred at the Satellite Tank Farm (STF). The spill report was initially filed with the report incorrectly assuming the source of this spill was the TCAs. As a result, the EcoLog ERIS Report and the Northwest Territories Environment and Natural Resources Hazardous Materials Spill Database, which were searched as part of the Phase I ESA update, referenced this incorrectly filed report. The

STF was investigated as part of the Phase II ESA update; therefore the correct area of the spill was captured as part of the Phase II ESA update. An amended updated Phase I/II ESA report will be submitted with this corrected information.

In closing, LMI wishes to emphasise that it requests that the Board reduce the security required under Part C, of the Water Licence as soon as possible. The project is currently over bonded by \$13.6M, and the current situation is causing the company hardship. It also is impacting the available funds to carry out reclamation activities going forward. LMI will be submitting a Final Closure and Reclamation Plan to the NWB in Q1/2017 for approval. We respectfully submit that INAC's request to delay the process not be accepted and that the NWB move forward with reviewing LMI's new security cost estimate which we believe provides the evidence to support a reduction in security and will assist LMI in moving forward with reclaiming the Lupin Mine over the next two season. This would be consistent with the timelines discussed at the aforementioned meetings and discussed with various INAC groups such that LMI can move to permanent reclamation for the 2018 and 2019 field seasons. (Refer to Attachment A)

Yours truly,

Karyn Lewis

Karyn Lewis
Lupin Mines Incorporated
778-386-7340

Attachment A – Timelines

Attachment B – Q4 2017 Progress Report

ATTACHMENT A – TIMELINES

Lupin Mine and Ulu Project Reclamation Timelines

Draft – For Discussion

Comments from meeting with INAC, NWB and KIA included

Ulu – Reclamation Timeline	2017 Q4	2018 Q1	2018 Q2	2018 Q3	2018 Q4	2019 Q1	2019 Q2
Phase 1 – Approval of Final Closure Plan and Reclamation Work Program							
Submit Draft Closure Plan – MND to KIA	Sept						
Engage with INAC on Final Closure Plan – MND	Oct						
Establish Multi-Stakeholder Working Group for Regular meetings until Final Closure	Oct						
Submit Final Closure Plan Application – MND to NWB	Nov						
Submit Ice Road Application – Ulu to Lupin – MND/Contractor to INAC, KIA, NWB, NIRB							
Approval of Final Closure Plan – NWB to MND – 6 Months			★				
Implement and Complete Reclamation Work Program - MND							
Approval for Ice Road – INAC and KIA to MND					★		
Inspection Process - INAC and KIA							
Submit Application to Reduce Security and Renew Water Licence - MND to NWB							
Build and Use Ice Road from Ulu to Lupin – Contractor/MND							
Decision on Security Reduction from NWB to MND for Final Closure							★
Phase 2 – Post-Closure Monitoring							
Post Closure Monitoring							

Lupin – Gold Mine Reclamation Timeline	2017 Q4	2018 Q1	2018 Q2	2018 Q3	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2
Phase 1 – Security Reduction and Approval of Final Closure Plan											
Submit \$7.1m ILOC by Sept 30, 2017 to INAC and NWB	Sept										
Submit new Estimate and Amendment Application to Reduce Security – MND to NWB	Sept										
Engage with INAC/EC/DFO on Draft Closure Plan – MND											
Engage with KIA on Final Closure Plan – MND											
Submit Final Closure Plan Application - MND to NWB – including Progressive Reclamation Security Reduction Plan											
Establish Multi-Stakeholder Working Group for Regular meetings until Final Closure											
Decision on Security Reduction from NWB to MND											
Implement and Complete Progressive Reclamation Work Program – MND											
Submit Application for Ice Road - Lupin to Yellowknife – MND to Contractor											
Approval of Final Closure Plan with Progressive Security Reduction Plan – NWB to MND – 12 months											

Lupin – Gold Mine Reclamation Timeline	2017 Q4	2018 Q1	2018 Q2	2018 Q3	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2
Phase II – Final Reclamation and Final Security Decision											
Implement and Complete Reclamation Work Program - MND											
Approval for Ice Road – Contractor to MND											
Inspections Process - INAC											
Use Ice Road for Final Closure Process– Lupin to Yellowknife - MND											
Final Closure Security Decision											
Phase 3 – Post Closure Monitoring											
Post-Closure Monitoring											

ATTACHMENT B – Q4 2017 PROGRESS REPORT

LMI – THIRD PARTY RATES

During the security amendment in 2016 the NWB decision⁴ made reference that LMI may enjoy preferred rates from their third party contractor and that others may not have access to their preferred rates. LMI would like to confirm the use of third party contractors, however LMI does not enjoy and has not received a discounted or negotiated rate. Refer to Appendix A – Discovery (Primary Mine Site Maintainer), and Appendix B - Air Tinti – Primary Transportation Contractor.

LMI – FUEL TESTED

LMI has re-tested the fuel, as they committed during the water licence renewal process, and the fuel is useable. LMI used the fuel on-site this past season to carry out progressive reclamation. Refer to Appendix C for the fuel test results as well as a letter from Norwest Engineering confirming the fuel as useable.

LMI's 2016-2017 WORK

LMI has done further work on site during the 2016-2017 season, including:

- *Water sampling in accordance with NWB approvals*
- *Discharge sewage pond in accordance with NWB approvals*
- *Sampling, treatment and discharge of all water collected with the fuel berms in accordance with NWB approvals*
- *Ongoing general maintenance and repairs to site*
- *Completed an updated Environmental Site Assessment*
- *Completed Phase 4/5 EEM Study*
- *Site organization and clean up*

⁴ During the security amendment in 2016 the NWB decision made reference that LMI may enjoy preferred rates from their third party contractor and that others may not have access to their preferred rates. (Bolding added by LMI for ease)

*".....To avoid a reclamation estimate becoming too closely tied to an individual Licensee and the specific contractual arrangements that the Licensee enjoys at a given point in time, assumptions made on the basis of actual costs must be compared to more general unit cost estimates as provided for in the RECLAIM model to ensure that the estimates truly represent not only the reality of actual costs but also the reality that it **will not be the Licensee but a third party reclamation contractor** carrying out the reclamation.*

*On this basis, the Board has accepted that adoption of reasonable unit costs based on estimates (the approach taken by INAC and KP) is the more appropriate approach when preparing a reclamation cost estimate that is premised on the **assumption that the Licensee and any of their contractual and preferred pricing arrangements with third parties will not be available** if INAC has to realize on the security posted under the Licence."*

- *Waste backhauls (in excess of 340,500 lbs from 2015-2017) all unusable batteries removed from site*
- *Geotechnical inspection by a third party in accordance with NWB approvals*
- *Preparation, construction and operation of the Landfarm to treat hydrocarbon soil at located at the STF in accordance with the NWB approvals*
- *Transfer of water from Cell 5 to Pond 1 via syphon*
- *Repaired Dam M as per the 2015 Geotechnical report*
- *Repaired Dam N*
- *Cover of Cell 5 tailings per the closure plan*
- *Ongoing erosion repairs on dams, as per the 2015 Geotechnical report, roads and airstrip*

LMI's 2018-2019 WORK PLAN

LMI will be submitting a Final Closure and Reclamation Plan to the NWB in Q1/2017 for approval. We are providing the timeline that has been discussed with the NWB staff, INAC and the KIA for you information.

Work at the Lupin site would be to conduct environmental, restoration and maintenance work on-site in order to remain compliant with our NWB water licences. Specific work may include but is not limited to work that can be carried out within our water licence in preparation for approval of the Final Closure and Reclamation Plan. The specific tasks will ultimately be determined by the amount of accumulated snowfall and any estimated precipitation that may occur over the summer and fall. Although, LMI does currently plan on being at site all year and anticipates having an overland road from Ulu to Lupin during Q1/2018 to bring all the necessary equipment to carry out reclamation work at Lupin during the 2019 season.

Depending on the work to be completed we anticipate there will be between 5-30 people on site.

Appendix A – Letter from Discovery Mining re: Rates

Appendix B – Letter from Air Tindi re: Rates

Appendix C – Fuel Analysis and Memo



30th of March, 2017

To Whom it may concern:

This letter is to state that Lupin Mines has not been extended any preferred pricing for the work that Discovery Mining Services Ltd provides at their Lupin property.

If you have any questions please feel free to contact me at any time.

Regards,

A handwritten signature in black ink, appearing to read "K. Vickers", with a long, sweeping horizontal line extending to the right.

Kevin Vickers
Operations Manger
Discovery Mining Services
Phone: (867) 920-4600
Fax: (867) 873-8332
Email: kevin.vickers@discoverymining.ca

DISCOVERY AIR

AIR TINDI

P.O. Box 1693, Yellowknife, NT X1A 2P3

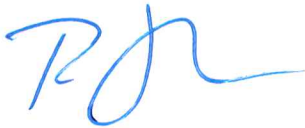
March 30, 2017

To Whom it may concern:

This letter is to advise that no special or discount charter rates have been offered, negotiated or extended towards Lupin Mines, or their agents, for aircraft charter flights in or around the Northwest Territories or Nunavut regions.

Please contact me with any questions.

Sincerely,



Bob Schnurr

Manager, Air Tindi

bobsc@airtindi.com

867 669-8223

phone 867.669.8200

www.airtindi.com

Memorandum

To	Karyn Lewis	Project #	924-3
CC		Date	November 28, 2017
From	Jim McKinley, Ph.D., P.Eng.		
Subject	2017 Lupin Project Diesel Sampling		

Diesel Sampling Results

To address the concerns regarding suitability of the diesel fuel at the Lupin Mine site, samples were collected from three tanks at the site in 2017 and analyzed for the full diesel specification suite. Upon receipt of the analytical results, knowledgeable industry personnel were consulted to evaluate the implications of the results. Tank fuel samples were compliant with the Canadian General Standards Board specification for Diesel Fuel (CAN/CGSB-3.517-2015 Type B) with the exception of total sulfur (15 mg/kg) and lubricity (wear scar diameter of 460 um). Two out of three samples exceeded the total sulfur specification and all samples exceeded the wear scar diameter specification.

As the diesel fuel in question is being used for off-road and mining activities, the applicable total sulfur specifications are outlined in CAN/CGSB-3.6 and CAN/CGSB-3.16. All samples fall below the total sulfur concentrations outlined in those specifications. The low lubricity values could cause more wear on engine components (e.g. fuel injection system) than diesel fuel with a higher lubricity value, but this can be corrected through fuel additives if deemed necessary. As such, the diesel fuel in question is of sufficient quality for use at the Lupin Mine site.

Author:



Jim McKinley, Ph.D., P.Eng.
Senior Hydrogeologist

Report of Analysis

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Reported: 23-Oct-2017
 Revision: 01

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Order Id: FL17_1439

Contract #:

PO#:

Report To:

Discovery Mining Services
 Box 2248
 Yellowknife, NT X1A 2P7

Attention: Kevin Vickers

E-mail: kevin.vickers@discoverymining.ca

Fax:

Invoice To:

Discovery Mining Services

Attention: DMS Accounts Payable

E-mail:

Fax:

Laboratory Sample Number: FL17_1439-001

Product: Diesel

Specification: CAN/CGSB-3.517-2017 B

Date Received: 13-Oct-2017

Sample Source

Reference: Tank 4

Location:

Tag Number:

Tank Number: Lupin Mine Main Tank Farm

Sample Notes

1

Specification Details

Analysis	Test Name	Specifications		Results	Units	Test Notes
		Minimum	Maximum			
Copper Corrosion - Classification	ASTM D130		No. 1	1a		
Water and Sediment	ASTM D1796 (modified)		0.02	<0.01	% (v/v)	2
Electrical Conductivity	ASTM D2624	25		>2000	pS/m	
Ash Content	ASTM D482		0.010	0.005	Mass %	
Carbon Residue, 10% Bottoms	ASTM D524		0.2	0.15	%	3
Cetane Number	ASTM D613	40.0		43.5		
Total Sulfur	ASTM D7039		15	331	mg/kg	4
Kinematic Viscosity @ 40°C (Bias-corrected)	ASTM D7042	1.70	4.10	2.056	mm ² /s (cSt)	
Wear Scar Diameter	ASTM D7688		460	500	um	5
Distillation 90% Recovered (corr)	ASTM D86		360.0	308.1	°C	
Corrected Flash Point	ASTM D93	40.0		56.0	°C	
Acid Number	ASTM D974		0.10	<0.02	mg KOH/g	

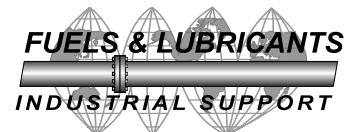
Tested Parameters (Note: Parameters in Specification Detail will also appear in complete listing)

Analysis	Test Name	Results	Units	Test Notes
Copper Corrosion - Test Duration	ASTM D130	3	hours	
Copper Corrosion - Test Temperature	ASTM D130	50	°C	
Copper Corrosion - Classification	ASTM D130	1a		
Water and Sediment	ASTM D1796 (modified)	<0.01	% (v/v)	2
Electrical Conductivity	ASTM D2624	>2000	pS/m	
Temperature of Sample	ASTM D2624	18.0	°C	
Density @ 15°C	ASTM D4052	848.8	kg/m ³	
Ash Content	ASTM D482	0.005	Mass %	
Carbon Residue, 10% Bottoms	ASTM D524	0.15	%	3
Cloud Point	ASTM D5773	-44.5	°C	
Cetane Number	ASTM D613	43.5		
Total Sulfur	ASTM D7039	331	mg/kg	4
Density @ 40°C	ASTM D7042	831	kg/cm ³	
Dynamic Viscosity @ 40°C	ASTM D7042	1.731	mPa.s	
Kinematic Viscosity @ 40°C	ASTM D7042	2.083	mm ² /s (cSt)	
Kinematic Viscosity @ 40°C (Bias-corrected)	ASTM D7042	2.056	mm ² /s (cSt)	
Major Axis	ASTM D7688	0.54	mm	5
Minor Axis	ASTM D7688	0.45	mm	5
Wear Scar Diameter	ASTM D7688	500	um	5



InnoTech Alberta Inc. ~ Fuels & Lubricants

250 Karl Clark Road, Edmonton, Alberta, Canada T6N 1E4
Certified by the Standards Council of Canada as an Accredited Testing
Organization complying with the requirements of ISO/IEC 17025 for
specific tests registered with the Council



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Tested Parameters (Note: Parameters in Specification Detail will also appear in complete listing)

Analysis	Test Name	Results	Units	Test Notes
Distillation IBP	ASTM D86	156.6	°C	
Distillation 5% Recovered (corr)	ASTM D86	176.8	°C	
Distillation 10% Recovered (corr)	ASTM D86	183.5	°C	
Distillation 20% Recovered (corr)	ASTM D86	197.6	°C	
Distillation 30% Recovered (corr)	ASTM D86	213.6	°C	
Distillation 40% Recovered (corr)	ASTM D86	229.5	°C	
Distillation 50% Recovered (corr)	ASTM D86	243.3	°C	
Distillation 60% Recovered (corr)	ASTM D86	257.3	°C	
Distillation 70% Recovered (corr)	ASTM D86	271.4	°C	
Distillation 80% Recovered (corr)	ASTM D86	288.1	°C	
Distillation 90% Recovered (corr)	ASTM D86	308.1	°C	
Distillation FBP	ASTM D86	338.0	°C	
Distillation Residue	ASTM D86	1.3	%	
Distillation Loss	ASTM D86	0.4	%	
Corrected Flash Point	ASTM D93	56.0	°C	
Acid Number	ASTM D974	<0.02	mg KOH/g	

Order Id: FL17_1439**Contract #:****PO#:****Report of Analysis**

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Notes and Remarks

1. With the exception of total sulfur and lubricity (wear scar diameter) the results obtained on your sample comply with the requirements Canadian General Standards Board (C.G.S.B.) specification for Diesel Fuel (CAN/CGSB-3.517-2017 Type B) for areas of Canada which do not require lower flow properties than displayed by the cloud point result.
2. CAN/CGSB-3.517-2017 states that the referee test method for water and sediment shall be ASTM D1796 (modified). The test is modified by substituting the centrifuge tube specified in ASTM D2273 for the centrifuge tube in ASTM D1796.
3. The Canadian General Standards Board (CGSB) specification for Diesel fuel (CAN/CGSB-3.517-2017) states that the carbon residue analysis performed on 10% bottoms be a maximum of 0.1 %mass for Type A fuel or 0.2 %mass for Type B fuel.
4. The Canadian General Standards Board (CGSB) specification for Diesel Fuel (CAN/CGSB-3.517-2017) states that the sulfur content shall not be greater than 15 mg/kg.
5. The High Frequency Reciprocating Rig (HFRR) analysis can be used as an indicator of base fuel lubricity. The Canadian General Standards Board (C.G.S.B.) specification for Diesel Fuel CAN/CGSB-3.517-2017 states that an acceptable test result is defined as a wear scar diameter of less than or equal to 460 μm at 60°C. Some fuels with higher wear scar diameter may still provide adequate lubricity. The HFRR test does not always show the improved lubricity performance of lubricity additives in diesel fuel. The HFRR is one of five criteria that can be used to determine lubricity requirements.

Approved by:

Susan Brown

Specification Analytical Coordinator

Results relate only to items tested.**Contact Information**

Team Lead: Jodi Johnston

Phone: (780) 450-5547

Email: jodi.johnston@innotechalberta.ca

FM 037-001

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Order Id: FL17_1439

Contract #:

PO#:

Report To:

Discovery Mining Services
 Box 2248
 Yellowknife, NT X1A 2P7

Attention: Kevin Vickers

E-mail: kevin.vickers@discoverymining.ca

Fax:

Invoice To:

Discovery Mining Services

Attention: DMS Accounts Payable

E-mail:

Fax:

Laboratory Sample Number: FL17_1439-002

Product: Diesel

Specification: CAN/CGSB-3.517-2017 A

Date Received: 13-Oct-2017

Sample Source

Reference: Tank 13

Location:

Tag Number:

Tank Number: Lupin Mine Main Tank Farm

Sample Notes

1

Specification Details

Analysis	Test Name	Specifications		Results	Units	Test Notes
		Minimum	Maximum			
Copper Corrosion - Classification	ASTM D130		No. 1	1a		
Water and Sediment	ASTM D1796 (modified)		0.02	0.010	% (v/v)	2
Electrical Conductivity	ASTM D2624	25		272	pS/m	
Ash Content	ASTM D482		0.010	<0.001	Mass %	
Carbon Residue, 10% Bottoms	ASTM D524		0.1	0.04	%	
Cetane Number	ASTM D613	40.0		44.8		
Total Sulfur	ASTM D7039		15	5.9	mg/kg	
Kinematic Viscosity @ 40°C (Bias-corrected)	ASTM D7042	1.30	3.60	1.910	mm ² /s (cSt)	
Wear Scar Diameter	ASTM D7688		460	560	um	3
Distillation 90% Recovered (corr)	ASTM D86		290.0	285.3	°C	
Corrected Flash Point	ASTM D93	40.0		60.0	°C	
Acid Number	ASTM D974		0.10	<0.02	mg KOH/g	

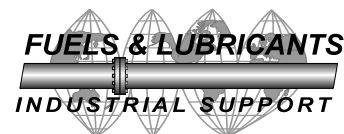
Tested Parameters (Note: Parameters in Specification Detail will also appear in complete listing)

Analysis	Test Name	Results	Units	Test Notes
Copper Corrosion - Test Duration	ASTM D130	3	hours	
Copper Corrosion - Test Temperature	ASTM D130	50	°C	
Copper Corrosion - Classification	ASTM D130	1a		
Water and Sediment	ASTM D1796 (modified)	0.010	% (v/v)	2
Electrical Conductivity	ASTM D2624	272	pS/m	
Temperature of Sample	ASTM D2624	18.0	°C	
Density @ 15°C	ASTM D4052	838.1	kg/m ³	
Ash Content	ASTM D482	<0.001	Mass %	
Carbon Residue, 10% Bottoms	ASTM D524	0.04	%	
Cloud Point	ASTM D5773	-43.6	°C	
Cetane Number	ASTM D613	44.8		
Total Sulfur	ASTM D7039	5.9	mg/kg	
Density @ 40°C	ASTM D7042	820	kg/cm ³	
Dynamic Viscosity @ 40°C	ASTM D7042	1.587	mPa.s	
Kinematic Viscosity @ 40°C	ASTM D7042	1.935	mm ² /s (cSt)	
Kinematic Viscosity @ 40°C (Bias-corrected)	ASTM D7042	1.910	mm ² /s (cSt)	
Major Axis	ASTM D7688	0.60	mm	3
Minor Axis	ASTM D7688	0.51	mm	3
Wear Scar Diameter	ASTM D7688	560	um	3



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Tested Parameters (Note: Parameters in Specification Detail will also appear in complete listing)

Analysis	Test Name	Results	Units	Test Notes
Distillation IBP	ASTM D86	164.4	°C	
Distillation 5% Recovered (corr)	ASTM D86	187.1	°C	
Distillation 10% Recovered (corr)	ASTM D86	192.5	°C	
Distillation 20% Recovered (corr)	ASTM D86	203.2	°C	
Distillation 30% Recovered (corr)	ASTM D86	213.5	°C	
Distillation 40% Recovered (corr)	ASTM D86	223.5	°C	
Distillation 50% Recovered (corr)	ASTM D86	234.1	°C	
Distillation 60% Recovered (corr)	ASTM D86	245.3	°C	
Distillation 70% Recovered (corr)	ASTM D86	257.0	°C	
Distillation 80% Recovered (corr)	ASTM D86	269.7	°C	
Distillation 90% Recovered (corr)	ASTM D86	285.3	°C	
Distillation FBP	ASTM D86	309.5	°C	
Distillation Residue	ASTM D86	1.3	%	
Distillation Loss	ASTM D86	0.3	%	
Corrected Flash Point	ASTM D93	60.0	°C	
Acid Number	ASTM D974	<0.02	mg KOH/g	

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Notes and Remarks

1. With exception lubricity (wear scar diameter) the results obtained on your sample comply with the requirements Canadian General Standards Board (C.G.S.B.) specification for Diesel Fuel (CAN/CGSB-3.517-2017 Type A) for areas of Canada which do not require lower flow properties than displayed by the cloud point result.
2. CAN/CGSB-3.517-2017 states that the referee test method for water and sediment shall be ASTM D1796 (modified). The test is modified by substituting the centrifuge tube specified in ASTM D2273 for the centrifuge tube in ASTM D1796.
3. The High Frequency Reciprocating Rig (HFRR) analysis can be used as an indicator of base fuel lubricity. The Canadian General Standards Board (C.G.S.B.) specification for Diesel Fuel CAN/CGSB-3.517-2017 states that an acceptable test result is defined as a wear scar diameter of less than or equal to 460 μm at 60°C. Some fuels with higher wear scar diameter may still provide adequate lubricity. The HFRR test does not always show the improved lubricity performance of lubricity additives in diesel fuel. The HFRR is one of five criteria that can be used to determine lubricity requirements.

Approved by:

Susan Brown

Specification Analytical Coordinator

Results relate only to items tested.**Contact Information**

Team Lead: Jodi Johnston

Phone: (780) 450-5547

Email: jodi.johnston@innotechalberta.ca

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Order Id: FL17_1439

Contract #:

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Report To:

Discovery Mining Services
 Box 2248
 Yellowknife, NT X1A 2P7

Attention: Kevin Vickers

E-mail: kevin.vickers@discoverymining.ca

Fax:

Invoice To:

Discovery Mining Services

Attention: DMS Accounts Payable

E-mail:

Fax:

Laboratory Sample Number: FL17_1439-003

Product: Diesel

Specification: CAN/CGSB-3.517-2017 A

Date Received: 13-Oct-2017

Sample Source

Reference: Tank 15

Location:

Tag Number:

Tank Number: Lupin Mine Main Tank Farm

Sample Notes

1

Specification Details

Analysis	Test Name	Specifications		Results	Units	Test Notes
		Minimum	Maximum			
Copper Corrosion - Classification	ASTM D130		No. 1	1a		
Water and Sediment	ASTM D1796 (modified)		0.02	<0.005	% (v/v)	2
Electrical Conductivity	ASTM D2624	25		698	pS/m	
Ash Content	ASTM D482		0.010	0.001	Mass %	
Carbon Residue, 10% Bottoms	ASTM D524		0.1	0.05	%	
Cetane Number	ASTM D613	40.0		41.2		
Total Sulfur	ASTM D7039		15	58.3	mg/kg	3
Kinematic Viscosity @ 40°C (Bias-corrected)	ASTM D7042	1.30	3.60	1.391	mm ² /s (cSt)	
Wear Scar Diameter	ASTM D7688		460	720	um	4
Distillation 90% Recovered (corr)	ASTM D86		290.0	251.9	°C	
Corrected Flash Point	ASTM D93	40.0		52.0	°C	
Acid Number	ASTM D974		0.10	<0.02	mg KOH/g	

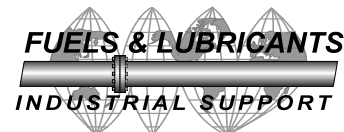
Tested Parameters (Note: Parameters in Specification Detail will also appear in complete listing)

Analysis	Test Name	Results	Units	Test Notes
Copper Corrosion - Test Duration	ASTM D130	3	hours	
Copper Corrosion - Test Temperature	ASTM D130	50	°C	
Copper Corrosion - Classification	ASTM D130	1a		
Water and Sediment	ASTM D1796 (modified)	<0.005	% (v/v)	2
Electrical Conductivity	ASTM D2624	698	pS/m	
Temperature of Sample	ASTM D2624	18.0	°C	
Density @ 15°C	ASTM D4052	821.1	kg/m ³	
Ash Content	ASTM D482	0.001	Mass %	
Carbon Residue, 10% Bottoms	ASTM D524	0.05	%	
Cloud Point	ASTM D5773	-65.6	°C	
Cetane Number	ASTM D613	41.2		
Total Sulfur	ASTM D7039	58.3	mg/kg	3
Density @ 40°C	ASTM D7042	803	kg/cm ³	
Dynamic Viscosity @ 40°C	ASTM D7042	1.131	mPa.s	
Kinematic Viscosity @ 40°C	ASTM D7042	1.409	mm ² /s (cSt)	
Kinematic Viscosity @ 40°C (Bias-corrected)	ASTM D7042	1.391	mm ² /s (cSt)	
Major Axis	ASTM D7688	0.73	mm	4
Minor Axis	ASTM D7688	0.70	mm	4
Wear Scar Diameter	ASTM D7688	720	um	4



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Tested Parameters (Note: Parameters in Specification Detail will also appear in complete listing)

Analysis	Test Name	Results	Units	Test Notes
Distillation IBP	ASTM D86	156.8	°C	
Distillation 5% Recovered (corr)	ASTM D86	173.5	°C	
Distillation 10% Recovered (corr)	ASTM D86	176.4	°C	
Distillation 20% Recovered (corr)	ASTM D86	182.4	°C	
Distillation 30% Recovered (corr)	ASTM D86	188.8	°C	
Distillation 40% Recovered (corr)	ASTM D86	196.0	°C	
Distillation 50% Recovered (corr)	ASTM D86	203.5	°C	
Distillation 60% Recovered (corr)	ASTM D86	212.4	°C	
Distillation 70% Recovered (corr)	ASTM D86	222.6	°C	
Distillation 80% Recovered (corr)	ASTM D86	234.9	°C	
Distillation 90% Recovered (corr)	ASTM D86	251.9	°C	
Distillation FBP	ASTM D86	281.8	°C	
Distillation Residue	ASTM D86	1.2	%	
Distillation Loss	ASTM D86	0.3	%	
Corrected Flash Point	ASTM D93	52.0	°C	
Acid Number	ASTM D974	<0.02	mg KOH/g	

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Notes and Remarks

1. With the exception of total sulfur and lubricity (wear scar diameter) the results obtained on your sample comply with the requirements Canadian General Standards Board (C.G.S.B.) specification for Diesel Fuel (CAN/CGSB-3.517-2017 Type A) for areas of Canada which do not require lower flow properties than displayed by the cloud point result.
2. CAN/CGSB-3.517-2017 states that the referee test method for water and sediment shall be ASTM D1796 (modified). The test is modified by substituting the centrifuge tube specified in ASTM D2273 for the centrifuge tube in ASTM D1796.
3. The Canadian General Standards Board (CGSB) specification for Diesel Fuel (CAN/CGSB-3.517-2017) states that the sulfur content shall not be greater than 15 mg/kg.
4. The High Frequency Reciprocating Rig (HFRR) analysis can be used as an indicator of base fuel lubricity. The Canadian General Standards Board (C.G.S.B.) specification for Diesel Fuel CAN/CGSB-3.517-2017 states that an acceptable test result is defined as a wear scar diameter of less than or equal to 460 μm at 60°C. Some fuels with higher wear scar diameter may still provide adequate lubricity. The HFRR test does not always show the improved lubricity performance of lubricity additives in diesel fuel. The HFRR is one of five criteria that can be used to determine lubricity requirements.

Approved by:



Susan Brown

Specification Analytical Coordinator

Results relate only to items tested.

Contact Information

Team Lead: Jodi Johnston

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